



# What faculty need to learn about improvement and how to teach it to others

G. DEAN CLEGHORN<sup>1</sup> & G. ROSS BAKER<sup>2</sup>

<sup>1</sup>Department of Faculty Development, Lawrence Family Practice Residency, Lawrence, MA, USA and <sup>2</sup>Department of Health Administration, University of Toronto, Canada

---

**Summary** *Quality improvement in health care, appropriately understood and applied, is one way to develop a sense of control over daily work. How can faculty members learn improvement methods, apply them to work and teach them to future health professionals? The paper outlines an improvement 'theory' and illustrates some ways it has been taught and learned by 10 interdisciplinary groups of faculty and students over the past 6 years. Eight domains constitute the content of improvement knowledge. They include: (1) health care as a system; (2) variation and measurement; (3) knowledge of the beneficiaries of health care services; (4) leading, following and making changes; (5) collaboration; (6) social context and accountability; (7) developing new locally useful knowledge; and (8) professional subject matter knowledge. Many lessons have been learned by 10 Local Interdisciplinary teams who have collaborated over the past 6 years including: (1) Systems knowledge is more effectively learned in the context of real work than in the classroom; (2) outcomes of care are beneficial sources of information to learn about the beneficiaries of care; and (3) the experience of collaboration with others—experts, colleagues, students and others—can be a learning tool in itself, especially in an inter-professional team. Involvement of students from multiple disciplines can enhance the impact of efforts to allocate resources in their organizations to building knowledge for improvement.*

**Key words:** *Quality improvement, improvement teams, domains of knowledge, educational collaborative.*

In the United States many health professionals feel 'in over our heads.' Because of this feeling, Robert Kegan's book (1994) by that title has an immediate attraction. He reminds us that the demands of modern life can be overwhelming because everyone is pressed to be autonomous, self-starting, systems thinkers who can handle multiple roles simultaneously. We feel caught between our ideals and the concrete realities around us, between getting our own needs met and helping others to meet their needs.

Quality improvement in health care, appropriately understood and applied, is one way to develop a sense of control over daily work—to reduce the sense of being in over one's head. The knowledge, skills and tools of quality improvement create capability to transform the 'messiness' of work life into defined processes that can lead to desirable outcomes for faculty, learners and recipients of health care.

The purpose of this paper is to address what faculty members can do to learn these methods, apply them to work and teach them to future health professionals. The paper

---

Correspondence to: G. Dean Cleghorn, <sup>1</sup>Department of Faculty Development, Lawrence Family Practice Residency, 34 Haverhill Street, Lawrence, MA 01841, USA. Fax: 978-687-2106. Email: dcleghorn@glfhc.org

outlines an improvement ‘theory’ and illustrates some ways it has been applied by 10 interdisciplinary groups of faculty and students over the past 6 years. Their efforts have been part of the Institute for Healthcare Improvement’s (IHI) Interdisciplinary Professional Education Collaborative (IPEC). For the past 3 years IPEC has also been called the Community-based Quality Improvement in Education of Health Professionals (CBQIE-HP). The aim of this IHI project has been ‘to improve health care by equipping new health professionals with the ability to improve continually the health of individuals and communities they serve’. Ten ‘local interdisciplinary teams’ (LITs) of health professions faculty from the following institutions have participated in the Collaborative.

- Medical University of South Carolina
- Case Western Reserve and Cleveland State Universities
- Medical College of Pennsylvania-Hahnemann University, LaSalle, Duquesne and Carnegie Mellon Universities
- George Washington and George Mason Universities
- University of Rochester and Highland Hospital
- Lawrence Family Practice Residency
- University of Miami School of Medicine
- Thomas Jefferson University Department of Family Medicine
- Montefiore Medical Center, Albert Einstein College of Medicine and Lehman College
- Portland State University, Oregon Health Sciences University and Veterans Affairs Medical Center.

The learning gained by these 10 interdisciplinary teams illustrates some advantages of creating a collaborative structure as a framework for mastering knowledge of improvement. The collaborative was created to provide a means for faculty and students from a variety of disciplines to work on local projects while learning about improvement. Disciplines have included health administration, nursing and medicine at a minimum, but other disciplines have been represented including social work, pharmacy, psychology, public health and others. Members of the collaborative have met twice yearly for 2 or 3 days. These meetings have combined lectures on specific improvement approaches, sharing of local experiences and joint planning for future learning.

Several factors have contributed to the richness of the collaborative as a learning environment. First, although teams have worked on a wide-ranging list of projects, they have shared a common aim as stated above. Secondly, members of the collaborative have recognized that there are few individuals who have mastery of improvement knowledge. The recognition that most faculty are ‘advanced beginners’ (Benner, 1984) with this topic has created a safe learning environment where faculty are not afraid of admitting what they do not know. Thirdly, the collaborative has created informal social pressures that encourage members to engage in continued learning even though most members already feel ‘fully engaged.’ These pressures come from the periodic requirement that each team provide updates on their activities using storyboards, written reports and presentations. Finally, the collaborative has provided a rich source of ideas and opportunities for academic products. Many collaborative members have been authors of peer-reviewed papers and presenters at national meetings. Several local teams have used their experience in this project as a framework to develop related projects. These academic rewards have provided considerable return on the investment of time and energy spent in joint learning.

Two questions help focus how these faculty teams have learned and how other faculty members can learn what is necessary to become effective teachers of improvement



**Figure 1.** Knowledge domains for continual improvement (Adapted from Batalden et al. 1998).

knowledge. First, what is the content? Secondly, how does one go about learning that content?

### **Content: knowledge of improvement**

Batalden *et al.* (1998) identified eight domains of knowledge regarding improvement in health care. Their list expands Deming's (1993) conception of 'profound knowledge'—that which is necessary to achieve improvements—and makes it directly applicable to health care. The eight domains include: (1) health care as a system, (2) variation and measurement, (3) knowledge of the beneficiaries of health care services, (4) leading, following and making changes, (5) collaboration, (6) social context and accountability, (7) developing new locally useful knowledge and (8) professional subject matter knowledge. The identification of these eight domains clarifies the knowledge relevant for improvement, which is drawn from many disciplines. The utility of this knowledge lies not just in the information and tools in each domain, but also in the relationships between domains. In effect, these domains comprise a system of knowledge useful for those who aim to improve health care. Recognizing this complexity, one can use the individual domains to structure learning about improvement. Full explication of these domains is beyond the scope of this paper, but a brief explanation of each domain follows. Each domain is defined with brief elaboration and at least one critical reference is listed. A visual representation of the eight domains is provided in Figure 1.

**Definition:** knowledge of 'health care as a system' pertains to how its many parts—health professionals, material resources, processes of care, beneficiaries of care, information systems, vision, accountability and so forth—are interdependent. The system can be understood at many levels, ranging from front line teams to large integrated delivery systems. Even at the most basic level, understanding the dynamic interplay of these parts is necessary to focus successful improvement efforts. Batalden & Mohr (1997) articulate a concise representation of the parts of the health care system and how they are interdependent.

**Definition:** knowledge of 'variation and measurement' encompasses methods for measuring outcomes and processes of care, as well as systematic principles and rules for judging the meaning of changes in measurements. This knowledge makes possible knowing how to document the extent to which a change is actually an improvement (or not). This domain includes statistical process control methods, an important set of tools that permit tracking and assessing the performance of individuals or systems over time. Valuable resources for

learning about this domain include Wheeler (1993), Nolan & Provost (1990) and Hoyer & Ellis (1996a,b).

Definition: knowledge of the ‘beneficiaries of health care’ pertains to the collection, analysis and interpretation of information necessary to match health care services to the health care needs in a population. The starting point should be available data for a particular set of beneficiaries—a panel of patients for an individual or a population of patients in a defined area, for example. The Clinical Value Compass (Nelson *et al.*, 1996) is useful for gaining knowledge of beneficiaries of care. It focuses on clinical outcomes, functional health status, patient satisfaction and costs as four ‘compass points’ to assess the value of health care to those being served. Using multiple data points and relating each set of outcome data directly to the processes of providing care are distinctive features of the Clinical Value Compass that promote gaining knowledge of the beneficiaries of health care.

Definition: knowledge of ‘leading, following and making change’ is a domain concerned with the psychology of change—how people identify needed change, how others react to change and how change may be effectively managed. This broad area encompasses understanding the psychological characteristics of human motivation, learning, perception and personality, as well as the skills necessary to build a shared vision, empower others and deal with conflict. Useful resources for this domain include Thomas (1995), who wrote about the ‘human elements’ that foster or prevent success in improvement efforts. Plsek (1997) describes the theory behind and the methods that will generate creative approaches to innovation and change. In *Leading Change* O’Toole (1996) argues for values-based leadership.

Definition: ‘collaboration’ is working with others and developing environments in health care that facilitate teamwork and team learning for the benefit of the patient or client. This domain includes the knowledge and skills necessary for individuals to work in groups effectively and also how an organization can support the work of teams. Scholtes (1998) places teamwork at the center of leadership skills needed today.

Definition: ‘social context and accountability’ pertains to the expectations held by society that caregivers are responsible to improve the quality of health for individuals and populations. Recognition of the societal demands for accountability by caregivers can provide a powerful stimulus for higher quality service. Friedman (1997) summarizes issues related to this domain in the context of the responsibility held by managed care entities and academic health science institutions.

Definition: knowledge of ‘developing new, locally useful knowledge’ pertains to methods for testing change within a model for improvement. Langley *et al.* (1996) explicated the elements of this domain. This model for improvement entails asking three essential questions: (1) What are we trying to accomplish? (2) How will we know a change is an improvement? (3) What change will we make? To answer the third question a series of rapid plan-do-study-act cycles are conducted to test changes on a small scale.

Definition: ‘professional knowledge’ is the cumulative result from education within a particular health care discipline and is demonstrated through an appropriate process to obtain a license, certificate or other credential for providing health care. This professional knowledge is the source of many ideas for improvement. However, the power of this knowledge is amplified when linked with the knowledge and skills in the other domains. For example, knowing that beta-blockers may reduce the infarctions in patients who have had an AMI is insufficient unless caregivers can create systems where such patients routinely receive such drugs. An additional area of professional knowledge relates to the educational process. Knowledge of the teaching cycle of planning, teaching and reflection (Skeff *et al.*, 1997) can foster improvements in the academic health care setting, as well as being another target for improvement.

### How faculty can learn and teach knowledge for improvement

Health professions faculty can acquire the knowledge and skills of quality improvement through the following means:

1. Open reflection and self-assessment to clarify one's alignment with the use of principles outlined above to continually improve health care.
2. Shifting to new 'mental models' that reflect the philosophical and practical commitment to making small improvements every day.
3. Beginning the life-long journey toward mastery of the eight domains of improvement knowledge and their application to health care.

In the sections that follow are accounts of experiences from health profession faculty members over the past 5 years that illustrate how they have been involved in learning and teaching improvement knowledge.

### Alignment with principles of improvement

Health professionals in faculty roles are usually passionate about some area of their work. Although improvement itself may be a passion for some, it is usually a means of addressing another core area of interest. To learn and teach about improvement requires a meaningful link between the content of improvement knowledge and one's passion regarding professional knowledge. Without such a link the integrity of the teacher is compromised in a way Palmer (1998, p. 63) warned against—the separation of head and heart. Teaching the content of improvement knowledge to others involves not only 'head' knowledge, but also a commitment to how the knowledge is important (alignment).

For example the first author's professional passion, as an educational psychologist working in health profession education, is to change the learning process in constructive ways. Below is a description of his reflection and assessment of his own alignment with the principles of improvement.

The realization that improvement is about learning and a deep belief that the aim of health care should be to improve health combined to create in me an awareness of my own alignment with improvement knowledge. This conclusion came in 1990 when I was serving as executive director of a statewide, interdisciplinary consortium of 13 health professions educational institutions, including universities, hospitals and community agencies. This work context heightened my receptivity to the impact of Alvin Toffler's *PowerShift* (1990) and Peter Senge's *The Fifth Discipline* (1990). Two conclusions became intensely obvious.

First, based on Toffler's work, I came to understand how profoundly important it was to accelerate my own personal learning. Toffler galvanized by understanding of how the exponential growth of knowledge is the currency of success today and will be increasingly so in the future. I wondered how I could accelerate my learning enough to keep up with the rapid changes in health care and society at large.

Second, from Senge's work, I learned about what constitutes a 'learning organization' and became convinced that such an organization would be ideal. A few months later I met Peter Senge and he suggested that I contact Donald Berwick, a pediatrician in Boston, who was leading a national effort to improve health care. I took his advice at face value—perhaps the systematic improvement of health care was the key to fostering organizational learning and maybe my individual learning too!

Soon I learned that regular, daily learning (improvement) for individuals and



**Table 1.** *Mental models associated with collaborative health improvement*

Traditional	Kaizen
Additional education of health professionals is necessary after they complete their degree programs	Degree programs implement the first phases of learning that are intimately linked to later phases
Variation in learners' ability and achievement results in variation in health care	Measures of learning and health care outcomes can be meaningfully linked to improve health
Increased specialization requires an increased focus on disease	Increased specialization and technical advances free health professionals to relate as people
Meaningful change must take a long time	Short-cycle experimental change increases leverage for innovations that work
Health care is applied professional knowledge	Improvement knowledge combined with professional knowledge improves health care
A competent expert is better than a committee	A competent team is better than an expert

organizations has a name. The Japanese call it *kaizen*—making small improvements every day (Imai, 1986). It seemed that everything I began learning about improvement fit together—systems thinking, data-based decision-making, team learning, psychology of change, etc. It was clear that quality improvement, a life of *kaizen*, was for me.

### **New mental models**

Peter Senge describes 'mental models' (1990, pp. 174–204) as 'the images, assumptions and stories we carry in our minds of ourselves, other people, institutions and every aspect of the world. Mental models influence how we interpret what we see and hear, how we make sense of the world and how we act.' There are many mental models we assume to be true, but if reviewed critically, we would question and possibly change. Unfortunately, busy health professionals have too little time to reflect upon their own work, so many assumptions—mental models—operate unchecked.

One important shift in mental models is from our notions of standards to a notion of 'kaizen.' *Kaizen* comes from a Japanese way of thinking that every day is an opportunity to improve a little bit—continuous improvement. The shift is not away from standards, but rather to an ever-rising standard. Table 1 outlines mental model shifts that some faculty have experienced as they move toward learning to do and teach quality improvement.

This list is intended as a stimulus for further reflection about what it will take to learn and do collaborative improvement. There are other mental model shifts that could be added to help promote the improvement of health and health care. Having clarified one's own alignment with improvement principles and having become open to new mental models, one is better prepared to gain the knowledge of improvement. Learning improvement knowledge can take the form of independent study and reflection, but it also requires action. Faculty without prior formal education about improvement need not wait until they are experts to participate in improvement efforts. This can begin right away, personally or with others in your work.

### **Learning and teaching the eight domains of improvement knowledge**

The following sections reflect the experience of faculty who have begun the journey to learn

the content of improvement knowledge in order to teach it to other health professionals and students. A brief discussion is included about learning and teaching in each of the eight domains.

#### *Health care as a system*

One way to begin is to seek out others who have experience regarding the domains of interest. For example, early in the national demonstration project, the Interdisciplinary Professional Education Collaborative (IPEC), sponsored by the Institute for Healthcare Improvement (IHI), the four inaugural teams requested further learning about health care as a system. In response to the request, Paul Batalden, board chairman of IHI, presented a workshop for faculty on the topic in the fall of 1994. He has since published the content used for the workshop (Batalden & Mohr, 1997), which was adapted for the health care system from Deming's (1993) conceptualization of a system capable of improving itself. The 1-day workshop stimulated participants to re-think their beliefs about how to define the outcomes of education, how they meet societal needs and how to foster continual improvement of a system. The collaborative team in South Carolina experimented with different ways to teach systems ideas in their interdisciplinary quality improvement course. They concluded that didactic teaching of systems knowledge early in an introductory course did not produce effective learning. Instead, they chose to introduce systems ideas within the context of students' projects as appropriate to the project content and context. For instance, the systems relationship between process and outcome became clearer to learners who had just mapped guidelines for caring for people with hypertension.

#### *Variation and measurement*

In addition to 'book club' readings and attending workshops on this topic, the Lawrence local interdisciplinary team (LIT) chose to address measurement as an object of improvement. Return rate of evaluation forms was a constant problem in seeking to evaluate the performance of their family practice residents. To address this problem the Lawrence LIT decided to develop a quick, repeated-measure tool to evaluate learning experience a half-day at a time. Compared to other evaluation methods, return rates have doubled to about 65% and have been maintained this level for 6 months. These rates have been tracked and reviewed monthly using a control chart (a line graph with three standard deviation boundaries above and below the line). Use of a control chart for this purpose was useful for faculty and learners to gain knowledge about statistical process control, even though the relative importance of return rates was not as salient for them as the meaning of the residents' satisfaction with their learning experiences. The stable return rate has now generated sufficient data for the curriculum committee to use in evaluating all major parts of the curriculum, which has provided additional knowledge on which to base improvements planned for the upcoming academic year.

This development became possible when the LIT members realized that existing evaluation data were inadequate to know when learning had actually improved. An important resource for this learning came from grant funds to hire personnel with continuous improvement, statistical and database experience to assist in compiling and tracking data, and to conduct workshops on improvement topics such as control charts with faculty and administrators. The LIT relied on the book *Understanding Variation* (Wheeler, 1993) as a key source of knowledge development for themselves and other faculty.

*Knowledge of the beneficiaries of health care*

Each of the 10 teams of IPEC has struggled with their aims in order to assure that educational changes for health professional students are made in light of their potential positive impact on the beneficiaries of health care. For instance, teaching medical and nursing students about continuous improvement must be done so that no harm is done to patients. In fact, ultimately patients should benefit from such efforts. Struggling with this issue is a fertile ground for faculty members to gain new knowledge about learners and about patients. In doing so, they have to give careful attention to the relationship between processes of care and education, on the one hand, and outcomes on the other. The Clinical Value Compass (Nelson, *et al.*, 1996) with its focus on clinical outcomes, functional health status and patient satisfaction can also be adapted as a model for measuring educational outcomes. Using multiple data points and relating each set of outcome data directly to the processes of providing care and education can lead to increased value for students and patients.

The Bronx LIT's aim is to decrease violence in their community (Bronx LIT, 1999). Using the Clinical Value Compass helped them clarify their work with a middle school. That is, reduced incidents of violence were viewed comparably to a clinical outcome. Working with middle school personnel to determine how to intervene to reduce incidents of school violence, the LIT students and faculty learned how to address another point on the compass—satisfaction—by addressing systems issues in addition to responding to individual complaints. Leadership team meetings as an intervention increased satisfaction among teachers and school administrators about how to relate to the LIT to achieve their common goals. The collaboration between health professionals and the school personnel to reduce violence led to data collection about the rates of violence and suspensions for students in the middle school—analogue to functional 'health' status of middle school students. During the 3-month period of the leadership team meetings, the number of suspensions dropped by over 67% compared to the same months of the previous year. They did not specifically measure costs, but costs could be measured for added resources (e.g. staff time) required for intervention activities, compared to savings or losses resulting from violent incidents. The value of the leadership team meetings facilitated by health profession students could then be assessed relative to decreases in incidents of violence and suspension rates and increased satisfaction of school personnel compared to costs. What is the bottom line? Systematic use of multiple outcomes, defined by the Clinical Value Compass, to gain knowledge of beneficiaries of health care can stimulate ideas for improvements as well as providing useful measures of changes that occur.

*Leading, following and making change*

Two excellent resources for learning about the psychology of change are *The Improvement Guide* (Langley *et al.*, 1996) and *The Human Dimension of Quality* by Brian Thomas (1995). The former is a practical guide for determining what kinds of changes are likely to be successful for given situations. The latter identifies many of the pitfalls that prevent success of improvement efforts. For example, most of the IPEC teams confronted problems in bringing together students from the different disciplines—medicine, nursing, health administration and others—for a common learning experience. Thomas gives an excellent framework for confronting this issue. Is it a 'fact, puzzle or problem?' If the curricular polarization between disciplines is simply a fact of life, it may not be worth trying to change. If, however, it is a puzzle—an algorithm will solve it—then improvement can occur through an almost rote application of well-defined steps and tools. If, however, it is a problem, then the human dimension must be considered much more fully and a broad range of creative outcomes that



could be acceptable solutions must be explored. The difference between a puzzle and a problem is that there is a clear, single solution to a puzzle, whereas there may be many different solutions to a problem. Many LIT improvement teams found that ‘processes’ assumed to be clear were not. For instance, a team of nurses associated with one project each followed different procedures for what they believed to be a common process of how to link care to social services. Not only were the outcomes very disparate, the process of whom to call and what to say were surprisingly different to the team members themselves. The issue was not a puzzle—how to modify a part of the process to make it work right, but it was more a problem of how to create and maintain better teamwork among those involved who did not realize their teamwork was lacking.

*Collaboration—interdisciplinary teamwork in the improvement of education and health care*

The South Carolina Local Interdisciplinary Team (SC LIT) was one of the four original teams to participate in the IHI Interdisciplinary Professional Education Collaborative. Learning about interdisciplinary teamwork and collaboration was the theme of their project report at the end of the first 3 years of IPEC. The group consisted of a physician, a nurse, pharmacist, medical information specialist, psychologist and statistician. Below is an adaptation of comments from the four current members of this team (South Carolina LIT, 1996).

Member I: We drew upon a variety of resources—books and journal articles (more theory), Internet list serves (learning from the performance of others) and our team consultants (guest performers), sharing our insights and confusion with each other. (Item #1 below) We were coming together as an interdisciplinary team.

Member II: In February 1995, at the invitation of the project director of a federally-funded Rural Interdisciplinary Training Grant ... our team presented a half-day introductory CI workshop to an audience of university and community faculty, staff and preceptors ... (Item #2 below). We spent considerable time practicing for the workshop and clarifying our respective roles. (Item #3 below) We wanted to model team synchrony for the audience. Using Langley, Nolan and Nolan’s ‘model for improvement’ to structure the workshop and incorporating such CI tools as brainstorming (method for generating many different ideas), nominal group technique (way to insure equal participation among members of a team), affinity diagram exercise (to cluster common ideas) and multi-voting (quick way to agree on group priorities, Brassard & Ritter, 1994), we held the audience’s attention and encouraged their participation. (Item #4 below)

Member III: Aligning all the participants who attended the retreat toward a common aim—using the model for improvement—was a wonderful feeling! It was the first time I felt we really performed as a harmonious team (Item #5 below) in front of an audience. (pp. 14–15)

Member IV: The documentation of our team’s efforts and outcomes (Item #6 below) has been exceptional. I am amazed at how harmoniously we perform, whether arranging a course [or] engaged in other creative activities. Once in a while I ponder why we have stayed together and developed such synchrony. Like many teams, we have our highs and our lows. Occasionally, we have been confused about our team’s direction or some of us have not practiced between sessions. The players on our team have changed several times, with new members bringing different ideas and unique perspectives. We have moments of strong feelings and loud intensity. Yet, somehow, we always manage to reach a common understanding and agreement of how we should work together. (Item #7 below) We actively listen to and are

respectful and appreciative of each other's talents and unique contributions to the team's efforts. (pp. 33–34; Item #8 below.)

These comments illustrate the following important learning issues for faculty and students who want to master the domain of collaboration.

1. Studying together builds teamwork and knowledge.
2. The teaching-learning process is one context for learning about how to work as a team.
3. Early team learning must include learning about how to be a team.
4. Continuous improvement tools can be used to teach about teamwork.
5. Demonstrating team behavior is a good way to teach others about collaboration.
6. Record keeping is an essential element of teamwork.
7. An explicit aim facilitates learning within a team and communication with other teams.
8. Alignment of individual aims with the team's aim can overcome 'failures' by individuals, changes in team composition, and personal and professional differences to achieve exceptional success by the full team.

The solid teamwork in this LIT was apparent to students, as well as to the faculty. Different students over three semesters of an improvement course identified the interdisciplinary collaboration as one of the primary strengths of the course. They held a consistent view with students from other LITs that interdisciplinary collaboration led them to learn '... the values and traditions that were unique to each discipline and (they) developed a greater appreciation for the perspective and insight that were afforded by an interdisciplinary setting' (Alexander *et al.*, 1996).

#### *Social context and accountability*

In *Post-Capitalist Society*, Peter Drucker (1993) made the case that organizations are shifting from being 'power-based' to being 'responsibility-based.' He suggested that the full transition will not be complete for many years in the future, but pointed out how the spread of power through the information age, the rise of individual entrepreneurialism, shrinking resources and other factors will increasingly lead organizations to greater focus on responsibility to society. This description of social context and accountability may be more appealing than what exists in the current health care world of managed care, where public demands and economic incentives seem to be on a collision course (e.g. Friedman, 1997). In developing their local aims, the more positive view above is evident in the work of IPEC teams, who have chosen to address community concerns including violence, access to care, rural care, smoking, immunizations for elders and substance abuse, among other issues. Most faculty members and students find energy and fulfillment by connecting their own interests to societal needs. Exploring how to meet those needs has become a fruitful context for learning and teaching improvement.

#### *New, locally useful knowledge*

Health professionals learn the scientific method very early in their education. This domain is about applying it to their daily work. *The Improvement Guide* (Langley *et al.*, 1996) is an excellent text for how to do so. It is the first resource for faculty to consult to learn about this domain. Cognitive knowledge of this domain, however, is not enough. Trying out the model—doing an improvement project—is the best key to learning. Many IPEC faculty members have begun their initial improvement work by seeking an improvement in their personal lives. Weight loss, exercise, organizational skills, dissertation completion and many

other personal successes have been experienced. Learning by doing has its rewards! A personal improvement project workbook is available on request from Case Western Reserve University (Kashkoush *et al.*, 1997). Faculty members and students have expanded the idea to ongoing improvement projects at work, connecting with others as a means of learning about the application of the scientific method to daily work. The Cleveland LIT (Headrick *et al.*, 1998) described an excellent example of how to teach and learn this domain while actually doing it. Using the Plan-Do-Study-Act learning cycles they were able to establish new partnerships with health care organizations in the Cleveland area through which faculty and students could engage in learning about continuous improvement while doing collaborative improvement projects.

### *Integrating improvement knowledge with professional knowledge*

Faculty participants in the IPEC project have easily integrated improvement knowledge with their professional knowledge in medicine, nursing, administration or other fields. Examples include health needs of the homeless, known factors leading to violence in schools, access to care, geriatric care and so forth. First, the knowledge of professional educators already includes many elements of improvement knowledge. Health professions faculty already know much about systems, measurement, recipients of care, psychology of change, teamwork, accountability and the scientific method. They were able to build on existing knowledge with refinements that relate directly to improvement knowledge. Improvement knowledge contains some new content, but mastery of improvement requires new ability to integrate all the domains of improvement knowledge. Given a local system of care, what are the key measures that will demonstrate desired improvements? What characteristics of the health care recipients are the most important factors in producing desired outcomes? How will employees react to needed changes in the system? How do caregivers work together with each other and with patients? What local and distant societal factors affect today's decisions about any of the other domains of improvement knowledge? How do all the domains contribute to the selection of what improvements to make? How does professional knowledge interact with each of the domains to enhance progress toward improvements?

Finally, the integration of improvement knowledge and professional knowledge for the faculty member includes integration in his or her teaching of professional knowledge. The concepts and examples briefly described above apply to the faculty member and to the student, both as learners. Understanding the content to be learned and how to learn the content transfers directly into the knowledge of how to teach improvement. In essence, learning to teach improvement is a collaborative process with learners to design and conduct the same kind of learning experiences for them as for one's self.

### **Summary of ways to learn improvement knowledge and teach it**

The experience of over 100 health profession faculty members working in IPEC during the past 5 years tells us much about how to gain improvement knowledge. From the brief discussion above, the following list is a summary of a few of the most important lessons.

- Faculty members must seriously reflect on their own commitment to 'kaizen' and share their experience with learners to encourage them to do the same.
- New mental models related to patient care and education, such as teacher as 'coach' or health care provider and patient as 'colleagues,' facilitate the transition into teaching about improvement.

- Systems knowledge (as well as knowledge in other domains) is more effectively learned in the context of real work than in the classroom.
- Learning about variation and measurement for improvement can be greatly facilitated through the use of institutional computer and statistical resources combined with specific improvement computer software for making control charts from data collected in a project.
- Outcomes of care are beneficial sources of information to learn about the beneficiaries of care—their characteristics and needs—which leads to understanding of what direction to take to seek improvement.
- The psychology of change and leadership provide a rich background for fostering flexibility, validating of differences and findings ways to join together in the pursuit of a common aim.
- The experience of collaboration with others—experts, colleagues, students and others—can be a learning tool in itself, especially in an inter-professional team.
- Improvement teams can effectively involve any meaningful combination of faculty, students and staff.
- Broad knowledge about the social context and accountability of health care can provide a boost to motivation for learning and teaching improvement when understood in relationship to one's own beliefs that coincide with societal values.
- How to develop new, locally useful knowledge as a field of knowledge is beneficial knowledge for a wide range of activities from individual improvement projects to multi-institutional collaborative ventures.
- Involvement of students from multiple disciplines can enhance the impact of efforts to allocate resources in their organizations to building knowledge for improvement.
- New horizons open for faculty and students who apply improvement knowledge to their own professional work and learning.

These lessons are a small set of ideas from eight vast domains of knowledge. Nevertheless, the learning behind these lessons represent a basis for beginning to learn and teach continuous improvement in collaborative health care settings.

## References

- ALEXANDER, G.C., FERA, B. & ELLIS, R. (1996). From the students: learning continuous improvement by doing it. *Joint Commission's Journal on Quality Improvement*, 22, 198–205.
- BATALDEN, P.B. & MOHR, J. (1997). Building knowledge of healthcare as a system. *Quality Management in Health Care*, 5(3), 1–12.
- BATALDEN, P.B., SPLAIN, M., BAKER, R., BISOGNANO, M. & HEADRICK, L.A. (1998). *Eight Domains of Improvement Knowledge*, Endorsed by the Institute for Healthcare Improvement.
- BENNER, P. (1984) *From Novice to Expert: excellence and power in clinical nursing practice*. Menlo Park: Addison-Wesley.
- BRASSARD, M., & RITTER, D. (1994) *The Memory Jogger: a pocket guide of tools for continuous improvement and effective planning*. Methuen: GOAL/QPC.
- BRONX LOCAL INTERDISCIPLINARY TEAM (LIT). (1999). *Bronx LIT Storyboard*, IHI IPEC Conference, Boston, 10 April, 1999.
- DEMING, W.E. (1993). *The New Economics*. Cambridge: Massachusetts Institute of Technology Center for Advanced Engineering Study.
- DRUCKER, P. (1993). *Post-capitalist Society*. New York: HarperBusiness.
- FRIEDMAN, E. (1997). Managed care and medical education: hard cases and hard choices. *Academic Medicine*, 72(5), 325–331.
- HEADRICK, L.A., MOORE, S.M., ALEMI, F., HEKELMAN, F., KIZYS, N., MILLER, D. & NEUHAUSER, D. (1998). Using PDSA to establish academic-community partnerships: the Cleveland experience. *Quality Management in Health Care*, 6(2), 12–20.
- HOYER, R.W. & ELLIS, W.C. (1996a). A graphical exploration of SPC—Part I: definitions and procedures. *Quality Progress*, 29(5), 65–73.

- HOYER, R.W. & ELLIS, W.C. (1996b). A graphical exploration of SPC—Part II: definitions and procedures. *Quality Progress*, 29(6), 57–64.
- IMAI, M. (1986) *Kaizen: the key to Japan's competitive success*. New York: McGraw-Hill Publishing Company.
- KASHKOUSH, S.L., NEUHAUSER, D. & ALEMI, F. (1997). *Personal Continuous Quality Improvement Project Work Book*. Cleveland: Case Western Reserve University.
- KEGAN, R. (1994). *In Over Our Heads: the mental demand of modern life*. Cambridge: Harvard University Press.
- LANGLEY, G.J., NOLAN, K.M., NOLAN, T.W., NORMAN, C.L. & PROVOST, L.P. (1996). *The Improvement Guide: a practical approach to enhancing organizational performance*. San Francisco: Jossey-Bass Publishers.
- NELSON, E.C., MOHR, J.J., BATALDEN, P.B. & PLUME, S.K. (1996, April). Improving health care, part 1: the clinical value compass. *The Joint Commission's Journal on Quality Improvement*, 22(4), 243–258.
- NOLAN, T.W. & PROVOST, L.P. (1990, May) Understanding variation. *Quality Progress*, 23(5), 70–78.
- O'TOOLE, J. (1996). *Leading Change*. New York: Ballantine Books.
- PALMER, P. (1998) *The Courage to Teach*. San Francisco: Jossey-Bass, Inc., Publishers.
- PLSEK, P.E. (1997). *Creativity, Innovation and Quality*. Milwaukee: ASQ Quality Press.
- SCHOLTES, P.R. (1998) *The Leader's Handbook*. New York: McGraw Hill Companies, Inc.
- SENGE, P. (1990). *The Fifth Discipline: the art and practice of the learning organization*. New York: Currency Doubleday.
- SKEFF, K.M., BOWEN, J.L. & IRBY, D.M. (1997). Protecting time for teaching in the ambulatory setting.' Academic LIT (1996, November). *Medicine*, 72(8), 694–697.
- SOUTH CAROLINA LOCAL INTERDISCIPLINARY TEAM (1996). *South Carolina LIT: a case study prepared for the second milestone conference of the IHI interdisciplinary professional education collaborative* (excerpts adapted). Philadelphia.
- THOMAS, B. (1995). *The Human Dimension of Quality*. London: McGraw-Hill Book Co.
- TOFFLER, A. (1990). *PowerShift*. New York: Bantam Books.
- WHEELER, D.J. (1993). *Understanding Variation: the key to managing chaos*. Knoxville, TN: SPC Press, Inc.